

	SURFACE VEHICLE STANDARD	SAE J532 MAR2013
		Issued 1918-02 Revised 2013-03
		Superseding J532 JUN1993
Automotive Straight Thread Filler and Drain Plugs		

RATIONALE

This document has been changed only to include current plating requirements.

1. SCOPE

This SAE Standard includes complete general and dimensional specifications for those types of filler and drain plugs (shown in Figures 1 to 7 and Tables 1 to 3) having straight threads which are commonly used with gaskets or seals in automotive and related industrial applications.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J548/1 Spark Plugs

SAE J548/2 Spark Plug Installation Sockets

SAE J846 Coding Systems for Identification of Fluid Conductors and Connectors

2.1.2 ASTM Publication

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 117 Method of Salt Spray (Fog) Testing

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3. GENERAL SPECIFICATIONS

3.1 Dimensions and Tolerances

Except for nominal sizes and thread specifications, dimensions and tolerances are given in both SI units and U.S. customary as designated. Tabulated dimensions shall apply to the finished plugs, plated, hardened, or otherwise processed, as specified by the purchaser. The minimum across corner dimensions of external hexagons shall be 1.092 times the nominal width across flats, but shall not result in a side flat width less than 0.43 times the nominal width across flats. The minimum across corner dimensions of external squares shall be 1.25 times the nominal width across flats, but shall not result in a side flat width less than 0.75 times the nominal width across flats. The diameter of the washer face on hexagon outside head plugs shall be equal to 95% of the maximum width across flats within a tolerance of $\pm 5\%$. At maximum material condition, the radii at corners of hexagon and square sockets in broached or upset plugs shall not exceed 0.13 mm (0.005 in).

Tolerance on dimensions not otherwise limited shall be ± 0.25 mm (± 0.010 in).

3.2 Straight Threads

Unified standard Class 2A external and Class 2B internal threads shall apply to inch sizes of plain finish (unplated) plugs and holes into which they assemble. For externally threaded parts with additive finish, the maximum diameters of Class 2A may be exceeded by the amount of the allowance, that is, the basic diameters (Class 2A maximum diameter plus the allowance) shall apply after plating. The pitch diameter tolerance for special diameter-pitch combinations shall be based on diameter, pitch, and a length of engagement of 9 times the pitch.

For metric sizes of plugs and mating holes, threads shall conform with SAE J548.

For convenient reference, the data generally required to specify threads is given in Table 1 for both the plugs and mating holes. (Inasmuch as threads are normally produced and gaged with equipment made to the respective measurement system, conversion of size designations and dimensions to other measurement systems is considered unnecessary.)

External threads shall be chamfered or rounded from the diameters tabulated in Table 4 to produce a length of chamfered or partial thread as specified.

3.3 Material and Manufacture

Plugs may be made from low carbon steel, cast iron, malleable iron, brass, bronze, or aluminum alloy as specified by purchaser, by casting, milling from the bar, or by upsetting from a grade of material free of defects which can adversely affect their serviceability.

3.4 Corrosion Protection

The external surfaces and threads of all carbon steel parts shall be plated or coated with a suitable material that passes a 96 h salt spray test in accordance with ASTM B 117. Any appearance of red rust during the 96 h salt spray test shall be considered failure, except for the following:

- a. All internal fluid passages
- b. Edges such as hex points, serrations and crests of threads where there may be mechanical deformation of the plating or coating typical of mass-produced parts or shipping effects.

- c. Areas where there is mechanical deformation of the plating or coating caused by crimping, flaring bending and other post-plate metal forming operations.
- d. Areas where the parts are suspended or affixed in the test chamber where condensate can accumulate.

Parts manufactured to this specification shall not be cadmium plated. Hexavalent chromate coatings are not preferred for commercial and industrial usage due to environmental reasons. Internal fluid passages shall be protected from corrosion during storage and shipping. Changes in plating can affect torque and require requalification when applicable.

3.5 Workmanship

Workmanship shall conform to the best commercial practice to produce high-quality parts. Plugs shall be free from all hanging burrs, loose scale, and slivers which might become dislodged in usage and all other defects which might affect their serviceability.

SQUARE AND HEXAGON HEAD

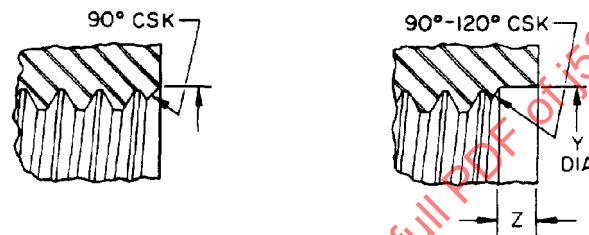


FIGURE 1 - RECOMMENDED HOLE DATA

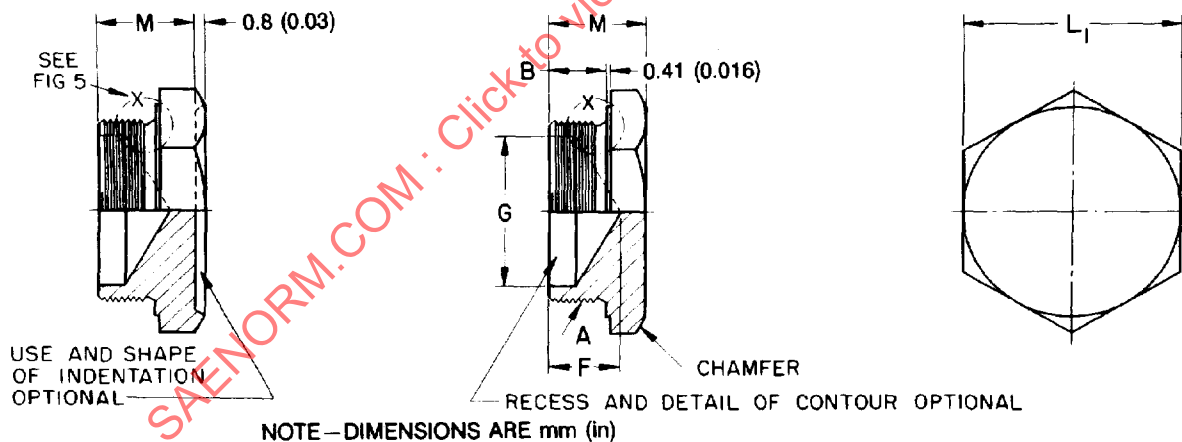


FIGURE 2 - HEXAGON OUTSIDE HEAD PLUG (420109A)

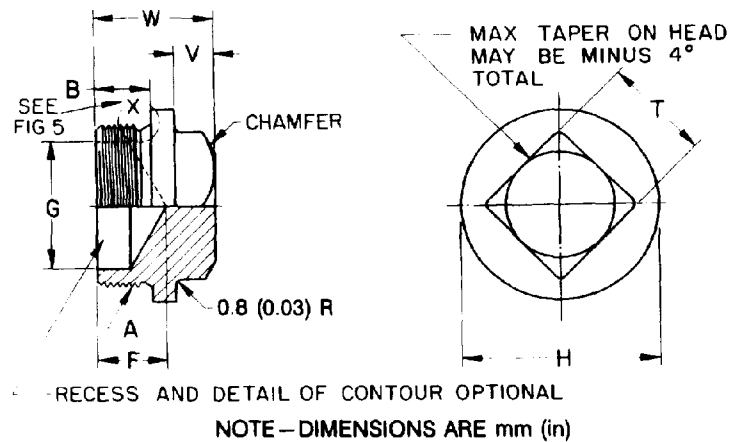


FIGURE 3 - SQUARE HEAD PLUG (420109B)

Codes Shown In Brackets Adjacent To Figure Numbers Represent Respective Fitting Identification In Accordance With SAE J846.

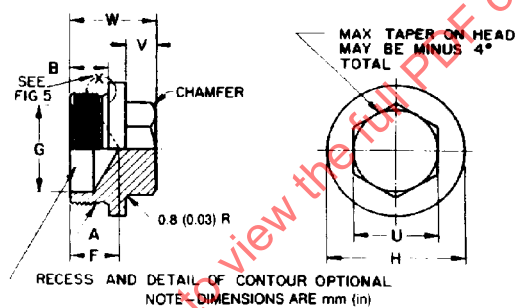


FIGURE 4 - HEXAGON INSIDE HEAD PLUG (420109C)

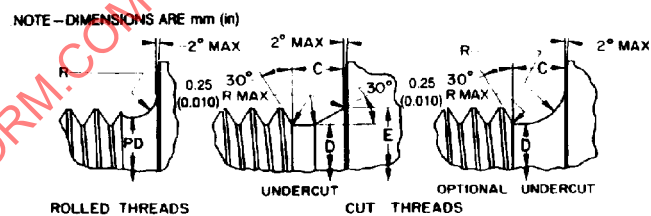


FIGURE 5 - DETAIL X ENLARGED

TABLE 1 - STRAIGHT THREAD SIZES (EXTERNAL AND INTERNAL) (FIGURES 1 TO 7)

Nom Size, in	Series Designation	External Thread Pitch	External Thread Pitch	External Thread Pitch	External Thread Pitch	Internal Thread Pitch	Internal Thread Pitch	Internal Thread Pitch	Internal Thread Pitch	Internal Thread Minor	Internal Thread Minor	Internal Thread Minor	Internal Thread Minor
		Diameter Max mm	Diameter Max in	Diameter Min mm	Diameter Min in	Diameter Max mm	Diameter Max in	Diameter Min mm	Diameter Min in	Diameter Max mm	Diameter Max in	Diameter Min mm	Diameter Min in
5/16-24	UNF		0.2843		0.2806		0.2902		0.2854		0.277		0.267
3/8-24	UNF		0.3468		0.3430		0.3528		0.3479		0.340		0.330
1/2-20	UNF		0.4662		0.4619		0.4731		0.4675		0.457		0.446
5/8-18	UNF		0.5875		0.5828		0.5949		0.5889		0.578		0.565
3/4-16	UNF		0.7079		0.7029		0.7159		0.7094		0.696		0.682
7/8-18	UNS		0.8375		0.8329		0.8449		0.8389		0.828		0.815
1-18	UNS		0.9625		0.9578		0.9701		0.9639		0.953		0.940
1-1/4-18	UNEF		1.2124		1.2075		1.2202		1.2139		1.203		1.190
1-1/2-18	UNEF		1.4624		1.4574		1.4704		1.4639		1.452		1.440
1-3/4-16	UN		1.7078		1.7025		1.7163		1.7094		1.696		1.682
2-16	UN		1.9578		1.9524		1.9664		1.9594		1.946		1.932
Metric Thread Sizes													
10 x 1 —		9.335		9.238		9.446		9.350		8.954		8.844	
14 x 1.25 —		13.155		13.048		13.297		13.188		12.962		12.499	
18 x 1.5 —		16.980		16.853		17.153		17.026		16.426		16.266	

SQUARE AND HEXAGON SOCKET HEAD

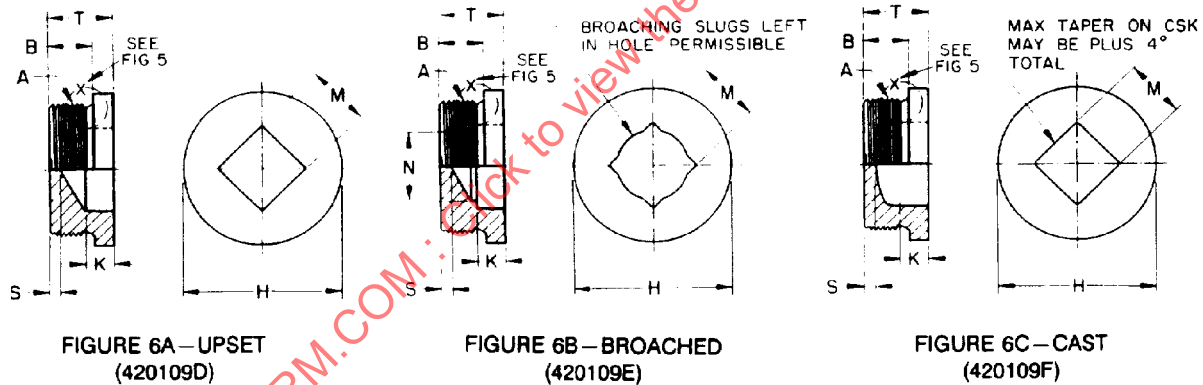


FIGURE 6 - SQUARE SOCKET HEAD PLUGS

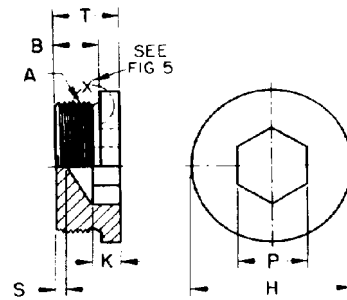


FIGURE 7A—UPSET
(420109G)

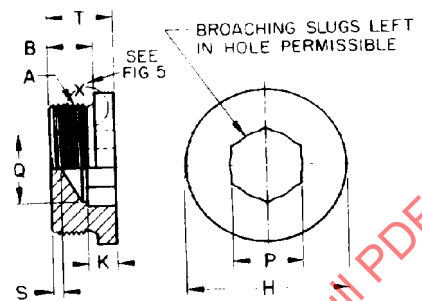


FIGURE 7B—BROACHED
(420109H)

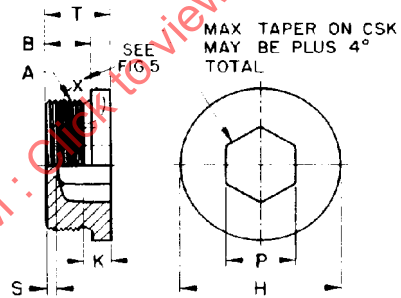


FIGURE 7C—CAST
(420109J)

FIGURE 7 - HEXAGON SOCKET HEAD PLUGS

**TABLE 2A—DIMENSIONS OF HEXAGON OUTSIDE HEAD AND SQUARE, AND HEXAGON INSIDE HEAD FILLER AND DRAIN PLUGS
(FIGURES 2 TO 5)**

Nom Size, in	B Shoulder Length mm	B Shoulder Length in	C Relief Width mm	C Relief Width in	D Relief Dia mm	D Relief Dia in	E Pilot Dia mm	E Pilot Dia in	F Recess Depth mm	F Recess Depth in	G Recess Dia, Max mm	G Recess Dia, Max in	H Flange Dia mm	H Flange Dia in	R Fillet Radius Approx mm	R Fillet Radius Approx in
5/16	7.9	0.31	2.3	0.09	6.40	0.252	8.33	0.328	—	—	—	—	14.2	0.56	1.07	0.042
3/8	7.9	0.31	2.3	0.09	7.98	0.314	9.93	0.391	—	—	—	—	15.7	0.62	1.07	0.042
1/2	8.6	0.34	2.3	0.09	10.87	0.428	13.11	0.516	10.4	0.41	6.4	0.25	19.0	0.75	1.27	0.050
5/8	9.7	0.38	3.0	0.12	13.84	0.545	16.28	0.641	11.9	0.47	9.7	0.38	22.4	0.88	1.42	0.056
3/4	9.7	0.38	3.0	0.12	16.76	0.660	19.46	0.766	11.9	0.47	12.7	0.50	25.4	1.00	1.57	0.062
7/8	10.4	0.41	3.0	0.12	20.14	0.793	22.63	0.891	12.7	0.50	14.2	0.56	28.4	1.12	1.42	0.056
1	11.2	0.44	3.0	0.12	23.32	0.918	25.61	0.016	14.2	0.56	17.5	0.69	31.8	1.25	1.42	0.056
1-1/4	11.9	0.47	3.0	0.12	29.64	1.167	32.16	1.266	15.0	0.59	23.9	0.94	38.1	1.50	1.42	0.056
1-1/2	12.7	0.50	3.0	0.12	35.99	1.417	38.51	1.516	17.5	0.69	28.4	1.12	44.4	1.75	1.42	0.056
1-3/4	14.2	0.56	3.0	0.12	42.09	1.657	44.86	1.766	19.0	0.75	35.1	1.38	50.8	2.00	1.57	0.062
2	14.2	0.56	3.0	0.12	48.44	1.907	51.21	2.016	19.0	0.75	41.1	1.62	57.2	2.25	1.57	0.062
Metric Thread Sizes																
10	7.9	0.31	2.3	0.09	8.53	0.336	10.41	0.410	—	—	—	—	15.7	0.62	1.00	0.039
14	8.6	0.34	2.3	0.09	12.19	0.480	14.40	0.567	10.4	0.41	7.9	0.31	20.6	0.81	1.25	0.049
18	9.7	0.38	3.0	0.12	15.82	0.623	18.39	0.724	11.9	0.47	11.2	0.44	23.9	0.94	1.50	0.059

1. See detail X in Figure 5.

**TABLE 2B—DIMENSIONS OF HEXAGON OUTSIDE HEAD AND SQUARE, AND HEXAGON INSIDE HEAD FILLER AND DRAIN PLUGS
(FIGURES 2 TO 5)**

Nom Size, in	R ₁ Fillet Radius ⁽¹⁾ Approx mm	R ₁ Fillet Radius ⁽¹⁾ Approx in	Hex Outside Head L mm	Hex Outside Head L in	Hex Outside Head M Overall Length mm	Hex Outside Head M Overall Length in	Square and Hexagon Inside Head T Square Size mm	Square and Hexagon Inside Head T Square Size in	Square and Hexagon Inside Head U Hex Size mm	Square and Hexagon Inside Head U Hex Size in	Square and Hexagon Inside Head V Square and Hex Height mm	Square and Hexagon Inside Head V Square and Hex Height in	Square and Hexagon Inside Head W Overall Length mm	Square and Hexagon Inside Head W Overall Length in
5/16	1.57	0.062	14.33 14.00	0.565 0.551	12.7	0.50	5.61 5.44	0.221 0.214	7.19 7.01	0.283 0.276	5.6	0.22	16.8	0.66
3/8	1.57	0.062	15.63 15.54	0.627 0.612	12.7	0.50	7.19 7.01	0.283 0.276	8.00 7.72	0.315 0.304	6.4	0.25	17.5	0.69
1/2	1.90	0.075	19.10 18.72	0.752 0.737	13.5	0.53	9.58 9.40	0.377 0.370	11.18 10.87	0.440 0.428	6.4	0.25	18.3	0.72
5/8	2.11	0.083	22.28 21.84	0.877 0.860	15.7	0.62	11.18 10.87	0.440 0.428	12.75 12.42	0.502 0.489	7.1	0.28	19.8	0.78
3/4	2.39	0.094	25.45 24.97	1.002 0.983	15.7	0.62	12.75 12.45	0.502 0.490	14.35 14.00	0.565 0.551	7.1	0.28	20.6	0.81
7/8	2.11	0.083	28.63 28.09	1.127 1.106	16.8	0.66	14.35 14.05	0.565 0.553	15.93 15.54	0.627 0.612	7.9	0.31	22.4	0.88
1	2.11	0.083	31.80 31.24	1.252 1.230	19.0	0.75	15.93 15.62	0.627 0.615	20.70 20.27	0.815 0.798	7.9	0.31	23.1	0.91
1-1/4	2.11	0.083	38.15 37.62	1.502 1.477	19.8	0.78	20.70 20.40	0.815 0.808	25.45 24.97	1.002 0.983	8.6	0.34	25.4	1.00
1-1/2	2.11	0.083	44.50 43.82	1.752 1.725	22.4	0.88	23.88 23.57	0.940 0.928	28.63 28.09	1.127 1.106	9.7	0.38	28.4	1.12
1-3/4	2.39	0.094	50.85 50.14	2.002 1.974	23.9	0.94	28.63 28.32	1.127 1.115	31.30 31.24	1.252 1.230	11.2	0.44	31.8	1.25
2	2.39	0.094	57.20 56.69	2.252 2.232	23.9	0.94	33.40 33.07	1.315 1.302	38.15 37.52	1.502 1.477	11.2	0.44	33.3	1.31
Metric Thread Sizes														
10	1.50	0.059	15.93 15.54	0.627 0.612	12.7	0.50	7.19 7.01	0.283 0.276	8.00 7.72	0.315 0.304	6.4	0.25	17.5	0.69
14	1.88	0.074	20.68 20.29	0.814 0.799	13.5	0.53	9.58 9.40	0.377 0.370	11.18 10.87	0.440 0.428	6.4	0.25	18.3	0.72
18	2.25	0.089	23.88 23.39	0.940 0.921	15.7	0.62	12.75 12.45	0.502 0.490	14.35 14.00	0.565 0.551	7.1	0.28	20.6	0.81

1. See detail X in Figure 5.

TABLE 3A—DIMENSIONS OF SQUARE AND HEXAGON SOCKET HEAD FILLER AND DRAIN PLUGS (FIGURES 5 TO 7)

Nom Size, in	B Shoulder Length mm	B Shoulder Length in	C Relief Width mm	C Relief Width in	D Relief Dia mm	D Relief Dia in	E Pilot Dia mm	E Pilot Dia in	H Flange mm	H Flange Dia in	K Socket Depth, Min mm	K Socket Depth, Min in	S Wall Thickness, Min mm	S Wall Thickness, Min in	T Overall Length mm	T Overall Length in
5/16	7.9	0.31	2.3	0.09	6.40	0.252	8.33	0.328	14.2	0.56	3.0	0.12	3.0	0.12	11.2	0.44
					6.22	0.245	8.15	0.321								
3/8	7.9	0.31	2.3	0.09	7.98	0.314	9.93	0.391	15.7	0.62	3.0	0.12	3.0	0.12	11.2	0.44
					7.80	0.307	9.75	0.384								
1/2	8.6	0.34	2.3	0.09	10.87	0.428	13.11	0.516	19.0	0.75	4.8	0.19	3.0	0.12	11.9	0.47
					10.69	0.421	12.93	0.509								
5/8	9.7	0.38	3.0	0.12	13.84	0.545	16.28	0.641	22.4	0.88	4.8	0.19	3.0	0.12	12.7	0.50
					13.64	0.537	16.08	0.633								
3/4	9.7	0.38	3.0	0.12	16.76	0.660	19.46	0.766	25.4	1.00	6.4	0.25	3.0	0.12	13.2	0.52
					16.54	0.651	19.23	0.757								
7/8	10.4	0.41	3.0	0.12	20.14	0.793	22.63	0.891	28.4	1.12	6.4	0.25	3.0	0.12	14.2	0.56
					19.94	0.785	22.43	0.883								
1	11.2	0.44	3.0	0.12	23.32	0.918	25.81	1.016	31.8	1.25	6.4	0.25	3.0	0.12	15.0	0.59
					23.11	0.910	25.60	1.008								
1-1/4	11.9	0.47	3.0	0.12	29.64	1.167	32.16	1.266	38.1	1.50	7.9	0.31	3.0	0.12	16.8	0.66
					29.44	1.159	31.95	1.258								
1-1/2	12.7	0.50	3.0	0.12	35.99	1.417	38.51	1.516	44.4	1.75	9.7	0.38	3.0	0.12	19.0	0.75
					35.79	1.409	38.30	1.508								
1-3/4	14.2	0.56	3.0	0.12	42.09	1.657	44.86	1.766	50.8	2.00	9.7	0.38	3.0	0.12	20.6	0.81
					41.86	1.648	44.63	1.757								
2	14.2	0.56	3.0	0.12	48.44	1.907	51.21	2.016	57.2	2.25	9.7	0.38	3.0	0.12	22.4	0.88
					48.21	1.898	50.98	2.007								
Metric Thread Sizes																
10	7.9	0.31	2.3	0.09	8.53	0.336	10.41	0.410	15.7	0.62	3.0	0.12	3.0	0.12	11.2	0.44
					8.36	0.329	10.24	0.403								
14	8.6	0.34	2.3	0.09	12.19	0.480	14.40	0.567	20.6	0.81	4.8	0.19	3.0	0.12	11.9	0.47
					12.01	0.473	14.22	0.560								
18	9.7	0.38	3.0	0.12	15.82	0.623	18.39	0.724	23.9	0.94	6.4	0.25	3.0	0.12	13.5	0.53
					15.60	0.614	18.16	0.715								

1 See detail X in Figure 5.